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(54) Optical disk and optical disk reproduction apparatus

(57) An optical disk recording thereon compressed moving picture data and an optical disk reproduction apparatus each capable of easily effecting trick play such as high speed reproduction and a retrieval operation at a high speed. Additional information necessary for trick play is recorded in an arbitrary area of an optical disk such as a TOC (Table of Contents) or a leading

sector (sector 0) of the disk, and a sector address is added to each sector. To conduct trick play, an I picture, a P picture and a B picture contained in a GOP layer inside a bit stream of compressed image data are extracted and reproduced in accordance with a reproduction speed by looking up a trick play table.

FIG. 1

INDEX NO.	SECTOR ADDRESS
1	0 0 0 0
2	0 0 0 1 F
3	0 0 0 2 7
4	0 0 0 4 B
.	.
.	.
.	.

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sector (sector 0) of the disk, and a sector address is added to each sector. To conduct trick play, an I picture, a P picture and a B picture contained in a GOP layer inside a bit stream of compressed image data are extracted and reproduced in accordance with a reproduction speed by looking up a trick play table.

FIG. 1

INDEX NO.	SECTOR ADDRESS
1	0 0 0 0 0
2	0 0 0 1 F
3	0 0 0 2 7
4	0 0 0 4 B
.	.
.	.
.	.

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Figs. 6A and 6B are diagrams each showing a sixth embodiment of the optical disk according to the present invention;

Fig. 7 is a schematic view showing a data format of the optical disk according to the seventh embodiment of the present invention;

Fig. 8 is a schematic view showing the data format of the optical disk according to the eighth embodiment of the present invention;

Fig. 9 is a schematic view showing the data format of the optical disk according to the ninth embodiment of the present invention;

Fig. 10 is a schematic view of tracks on an optical disk according to the present invention; and

Fig. 11 is a flowchart of an operation at the time of trick play.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, some preferred embodiments of the present invention will be explained with reference to the accompanying drawings. First, the embodiment shown in Fig. 1 will be explained.

Fig. 1 shows an optical disk according to the first embodiment of the present invention. The diagram shows a table for trick play on the optical disk. This trick play table records the numbers of pieces of music and movements (indices) and corresponding sector addresses for all the pieces and movements recorded on the optical disk, for example. Sector addresses are added to each sector of the optical disk, and this trick play table is recorded in an area such as a TOC (Table of Contents) or a leading sector (sector 0) of the disk.

When this optical disk is loaded to an optical disk reproduction apparatus, a system microcomputer first reads the trick play table and stores it in a work area. When trick play is effected, the address of the sector to be read out is determined by looking up this trick play table and is then retrieved on the optical disk so as to reproduce an image.

Because the address of the sector to be read out is determined by looking up the trick play table, retrieval can be carried out at a high speed.

Fig. 2 shows the optical disk according to the second embodiment of the present invention. The drawing shows the trick play table on the optical disk. The trick play table records all the sector addresses of the data recorded on the optical disk and the corresponding time codes. This trick play table is recorded in an area such as the TOC (Table of Contents) or the leading sector (sector 0) of the disk.

When this optical disk is loaded to the optical disk reproduction apparatus, the system microcomputer first reads the trick play table and stores it in the work area. When trick play is effected, the address of the sector to be read out is determined by looking up this trick play table, and the address is retrieved on the optical disk so as to reproduce the image.

Because the address of the sector to be read out is determined by looking up the trick play table during trick play other than normal reproduction, trick play can be easily conducted, and retrieval can be made at a high speed.

When compressed image data of a variable transfer rate is reproduced, the sector address cannot be determined from the time code because the sector address and the time code do not have a proportional relationship, and correct retrieval cannot be made. However, the corresponding sector address can be obtained by looking up the trick play table of this embodiment, and retrieval can be correctly made.

Fig. 3 shows the optical disk according to the third embodiment of the present invention. The drawing shows the trick play table on the optical disk. The trick play table records all the sector addresses of the data recorded on the optical disk and their contents. This trick play table is recorded in an area such as the TOC (Table of Contents) or the leading sector (sector 0) of the disk.

When the optical disk is loaded to the optical disk reproduction apparatus, the system microcomputer first reads the trick play table and stores it into the work area. When retrieval is effected, the address of the sector to be read out is determined by looking up the trick play table, and this address is retrieved on the optical disk so as to reproduce the image.

Because the address of the sector to be read out is determined by looking up the trick play table during trick play other than normal reproduction, trick play can be easily conducted and retrieval can be made at a high speed.

Fig. 4 shows the optical disk according to the fourth embodiment of the present invention. The drawing shows the trick play table on the optical disk. The trick play table records an SH (Sequence Header) added to the leading part of a GOP recorded on the optical disk and its sector address. This trick play table is recorded in an area such as the TOC (Table of Contents) or the leading sector (sector 0) of the disk.

When the optical disk is loaded to the optical disk reproduction apparatus, the system microcomputer first reads the trick play table and stores it in the work area. When retrieval is conducted, the address of the sector to be read out is determined by looking up the trick play table, and the address is retrieved on the optical disk so as to reproduce the image.

Because the address of the sector to be read out is determined by looking up the trick play table during trick play other than normal reproduction, trick play can be easily conducted and retrieval can be made at a high speed.

Fig. 5 shows the optical disk according to the fifth embodiment of the present invention. The drawing shows the trick play table on the optical disk. The trick play table records the sector addresses of the start and the end of an I picture recorded on the optical disk. This trick play table is recorded in an area such as the TOC

the B picture is further retrieved and reproduced skip-
pingly in addition to the I picture and the P picture at this
time, various speed reproduction can be smoothly
made. Thereafter, the operation described above is
repeated if the n-time speed reproduction continues.

Though the explanation given above deals with the
n-time speed reproduction operation, the present inven-
tion can be easily applied to reproduction in the reverse
direction when n in the n-time speed reproduction is
negative (-). Further, slow reproduction can be made
when $|n| < 1$.

As described above, when retrieval is made by
looking up the trick play table, image reproduction of the
GOP unit can be easily made in the image data
encoded by the MPEG system, for example. Therefore,
besides the normal speed continuous reproduction
operation, operations trick play such as slow reproduc-
tion, high speed reproduction, reproduction in the
reverse direction, and the high speed retrieval operation
become possible.

The present invention is not particularly limited to
the foregoing embodiments but can be changed or mod-
ified in various ways without departing from the scope
thereof.

In the optical disk according to the present inven-
tion, information necessary for trick play is recorded in
an arbitrary area such as the TOC (Table of Contents) or
the leading sector (sector 0) of the disk, and the sector
address is added to each sector. The optical disk repro-
duction apparatus looks up the trick play table, and
extracts and reproduces the I picture, P picture and B
picture contained in the GOP layer inside the bit stream
of the compressed image data. Accordingly, the present
invention can easily execute trick play such as slow
reproduction, high speed reproduction, reproduction in
the reverse direction and the retrieval operation. It is
obvious in the explanation given above that the image
data may be the moving picture or the still picture. It is
further obvious that the present invention can be simi-
larly applied to the audio data or control data carried by
the image data.

Claims

1. An optical disk recording thereon a main informa-
tion divided by a predetermined unit and identifica-
tion information in said division unit, characterized
in that said main information contains at least a
compressed image data, additional information
necessary for selectively reproducing said image
data is recorded in a specific area of said optical
disk before said main information is reproduced,
and said image data can be selectively reproduced
on the basis of said identification information by
reading said additional information.
2. An optical disk according to claim 1, wherein said
predetermined unit is a sector on a recording for-
mat of said optical disk, and said identification infor-
mation is the address of said sector.
3. An optical disk according to claim 1, wherein said
additional information is the one that represents
correspondence between the sector address on a
recording format of said optical disk and a chapter
of said image data.
4. An optical disk according to claim 1, wherein said
additional information is the one that represents
correspondence between the sector address on a
recording format of said optical disk and time infor-
mation of said image data.
5. An optical disk according to claim 1, wherein said
additional information is the one that represents
correspondence between the sector address on a
recording format of said optical disk and information
representing the contents of said main information.
6. An optical disk according to claim 1, wherein said
additional information is the one that represents a
table of sector addresses of a specific kind of image
information.
7. An optical disk according to claim 1, wherein said
additional information is the one that represents
correspondence between a sequence header
added to the leading part of a GOP (Group of Pic-
ture) stipulated by the MPEG standard and the sec-
tor addresses.
8. An optical disk according to claim 1, wherein said
additional information is the one that represents
correspondence between an I picture stipulated by
the MPEG standard and the sector address of the
start or end of said I picture.
9. An optical disk according to claim 1, which further
includes a plurality of said additional information,
and an identification code is added to each of said
additional information so that said additional infor-
mation can be identified.
10. An optical disk according to claim 2, wherein said
sector is further divided into blocks, a sync signal is
annexed to the leading part of each of said blocks
and the address of said sector is recorded, and the
address of said sector is the same for each block
inside said block.
11. An optical disk according to claim 2, wherein said
sector is further divided into blocks, a plurality of
kinds of sync signals are annexed to the leading
part of each of said blocks and the address of said
sector is recorded, and the address of said sector is
completed in a plurality of blocks inside said sector.

FIG. 1

INDEX NO.	SECTOR ADDRESS
1	00000
2	0001F
3	00027
4	0004B
.	.
.	.
.	.

FIG. 2

SECTOR ADDRESS	TIME CODE
00000	00:00:00
00001	00:00:01
00002	00:00:02
00003	00:00:03
.	.
.	.
.	.

FIG. 5

I PICTURE	SECTOR ADDRESS
I1	0 0 0 0 0
I2	0 0 0 1 F
I3	0 0 0 2 7
I4	0 0 0 4 B
.	.
.	.
.	.

FIG. 6A

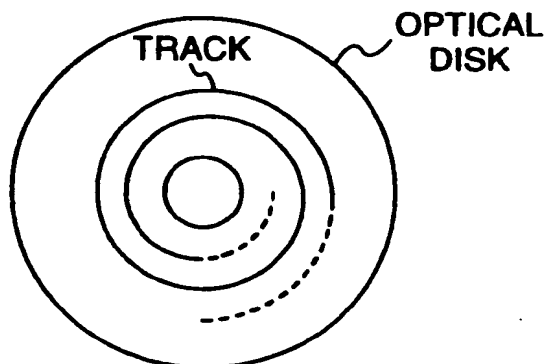


FIG. 6B

IDENTIFICATION CODE						
T1	TABLE 1	T2	TABLE 2	T3	TABLE 3	

FIG. 9

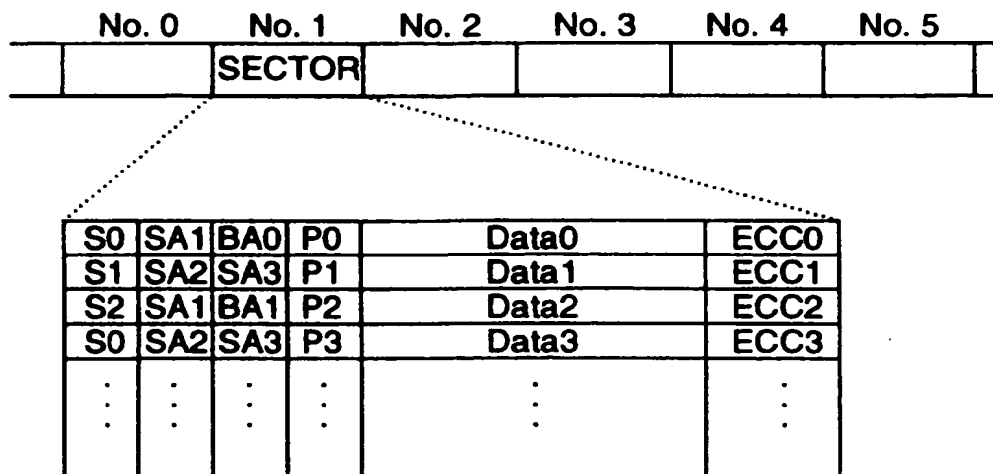
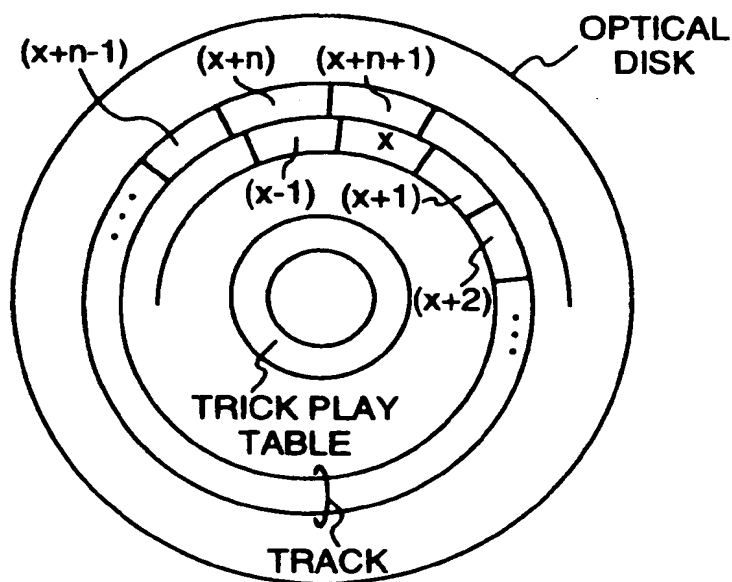


FIG. 10





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FIG. 1

INDEX NO.	SECTOR ADDRESS
1	0 0 0 0
2	0 0 0 1 F
3	0 0 0 2 7
4	0 0 0 4 B
.	.
.	.
.	.



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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claims	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 18, no. 687 (E-1651), 26 December 1994 & JP-A-06 276485 (VICTOR CO. OF JAPAN, LTD.), 30 September 1994, * abstract *	1,6,8, 12-15	
A	--- PATENT ABSTRACTS OF JAPAN vol. 18, no. 681 (E-1649), 21 December 1994 & JP-A-06 268969 (VICTOR CO. OF JAPAN, LTD.), 22 September 1994, * abstract *	1,2,4,8, 12-15	
A	--- US-A-4 361 849 (BOLGER) * the whole document * -----	1,12,14, 15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Place of search THE HAGUE		Date of completion of the search 24 September 1996	Examiner Daalmans, F
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document</p>			

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